Modelling of Pickup Ion Distributions in the Halley Cometosheath

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in the cometosheath, the center-of-mass plasma frame is approximately the bulk flow velocity of the implanted water group ions. The peaks of the observed Giotto IMS water group ion velocity distributions arc consistent with scattering to a bispherical shell in the distance range 1.8 to 1.2 x 10^5 km from the Halley nucleus. Successive distributions on approach to the comet show significant losses of ions at energies above the injection peak. Velocity diffusion and other acceleration processes act to broaden the distribution while loss mechanisms deplete the densities of ions particularly at high energies. These effects are modelled. The loss rates appear to be faster than can be explained by re-neutralization due to recombinant ion and charge exchange processes with the usual cross-sections. Empirical estimates for a production rate of fast neutrals arc obtained.